

Sensory, symptomatic, inflammatory, and ocular responses to and the metabolism of methyl tertiary butyl ether in a controlled human exposure experiment.

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Abstract: The Clean Air Act of 1990 mandates that those areas of the country that do not attain the health-based National Ambient Air Quality Standard for CO must add oxygenates (2.7% by weight) to auto fuels (oxyfuels). In the fall of 1992, the addition of methyl tertiary butyl ether (MTBE) to automotive fuels coincided with complaints of illness in some parts of the country. In Alaska, the reported symptoms included headache, nasal, throat, or ocular irritation, nausea or vomiting, dizziness, and sensations of "spaciness" or disorientation. We conducted a chamber exposure experiment to determine if exposure to pure MTBE would elicit similar responses to those reported to be related to MTBE exposure. Nineteen male and 18 female subjects were exposed in a repeated-measures design to clean air (CA) and 1.39 ppm (5.0 mg/m³) MTBE for 1 h. This level was selected to approximate a typical exposure experienced during refueling. Exposures were separated by at least 1 wk. Symptom questionnaires were completed before and during exposure. Cognitive testing was completed once during exposure. Objective measures of ocular and nasal irritation were obtained pre- and postexposure. Four questions relevant to the reported symptoms, relating to air quality, odor strength, headache, and nasal irritation, were considered confirmatory hypotheses. All other measures were exploratory. The only significant confirmatory result was a difference in rating of CA quality by the female subjects as better than during the MTBE exposure. No other measures, objective or cognitive, approached significance. These results indicate that in young, healthy subjects a 1-h exposure to 1.39 ppm MTBE does not increase symptom reporting or result in increases in objective biomarkers of inflammation. Two subjects also participated in a study of the pharmacokinetics of MTBE in which blood samples were obtained before, during, and at various time points up to 7 h postexposure. MTBE in blood rose rapidly and was metabolized to tertiary butyl alcohol (TBA), which gradually increased in the blood and maintained an elevated level for the duration of the sampling.